

ARCHEOLOGICAL INVESTIGATIONS AT TWO SITES
ON SAN NICOLAS ISLAND, CALIFORNIA

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The island of San Nicolas, located about 55 miles off the southern California coast, has been a rich source of prehistoric Indian materials for both museums and private collectors. Though sporadic excavations have revealed graves and associated goods, great numbers of artifacts and human bones have been gathered simply from the surface, where they had been exposed by rain and strong winds. The elements undoubtedly have caused the destruction of much of the archeological potential of this heavily eroded island. A tabulation of the various early investigations and resultant collections has been presented by Meighan and Eberhart (1953, p. 112) along with a generalized picture of the island's archeology based on a site survey which they conducted plus the meager published data available. In all reports, however, emphasis has been on the items manufactured from bone, stone, and shell, and there has been mention only in passing, if at all, regarding the cordage and woven materials of sea-grass which have been recovered, now numbering several hundred pieces in various collections.

It is surprising that these perishables have survived in some of the sandy middens even though the sites are situated in open and exposed locations. The resistance of the sea-grass to decay has meant the preservation of details of weaving technique as well as the furnishing of some information on the uses of the fabrics. Unfortunately, much of the excavated material has come from extremely shallow deposits only a few inches deep, or with little or no exact information regarding position, association, or depth. An analysis (Rozaire, Ms.) of collections of San Nicolas material in the Antelope Valley Indian Museum and the Los Angeles County Museum has revealed a number of weaving skills, primarily in the technique of twining, indicating in turn a well-developed textile art.

To learn more about this craft and especially its development and changes, a survey trip was planned to the island in order to check the possibilities of fruitful excavation of a site or sites which would yield woven sea-grass materials in deep stratigraphic position and/or in meaningful relationships with other cultural materials to determine more specifically the

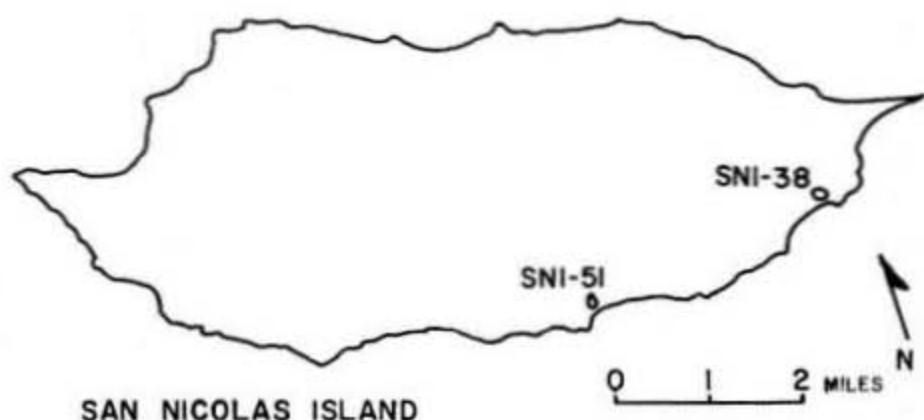


FIG. 1—SITES EXCAVATED ON SAN NICOLAS ISLAND

function and whole shape of these fabrics. Accordingly, arrangements were made with the U.S. Navy and a three day visit ensued to San Nicolas by the author and Bruce Bryan, who had worked on the island for the Los Angeles County Museum in 1926. Most of the sites shown by Meighan and Eberhart (1953, Fig. 33) were examined and those in the southeastern region were investigated in particular as this area has yielded the most evidence of sea-grass weaving (Fig. 1).

Site SNI-51 (Fig. 10) was the first to produce the sought-after fabric material. A maximum depth of 9 feet of midden with sea-grass protruding at various levels was revealed by an extensive gash (possibly the result of bulldozer work to provide road fill) some 30 feet wide and 100 feet long running through the mound. The second promising site was brought to our attention by Lt. Cmdr. J. A. Jolly and HM2 Harry Starbuck, who noticed human bone and pieces of textile weathering out of site SNI-38 (Fig. 2). They dug into the area and reported their findings along with the materials. Though most of the site appeared worn away, one area yielded enough human bone and sea-grass to warrant further investigation.

This information made it worth while to return for a longer stay several months later in order to excavate at these two sites. On the return, two weeks were spent in digging, with most of the time devoted to working at site SNI-38. At both sites the excavation unit consisted of five-foot squares which were dug in six inch levels with all soil passing through $\frac{1}{4}$ inch mesh screens. Trowel and shovel were used about equally to loosen the dirt. A total of 8 five-foot squares were dug, 6 at site 38 and 2 at site 51. Except for three days, strong, gusty winds blew constantly making work difficult at times.

SITE SNI-38

Excavation began at SNI-38, located on the east edge of a sandy beach in the southeast portion of the island. This site, situated about 30 feet above sea level and extending 200 feet in both north-south and east-west directions, is heavily eroded with only the lower, southern one-quarter appearing to remain salvageable (Fig. 3). The weathered nature of the site gives the impression that it is shallow, but midden debris occurred continuously down as deep as 4 feet. The profile of the west wall of square K56 shows a compact, sterile, light yellow-tan sand layer more than 3 feet thick over the midden, indicating a subsequent build-up after the end of aboriginal occupation.



FIG. 2—SITE SNI-38 EXCAVATION, LOOKING NORTH

Should this overburden be a remnant of what was a generalized condition at the site, an age of several hundred years more might be indicated for the deposit below. The eastern face of the 10 foot square pit shows a sterile layer at a depth of about one foot (Fig. 4, btm.) separating a gray and brown midden possibly indicating two different periods of occupation, though the artifact depth distributions do not show significant variations. The western portion of the square is at the edge of the site and perhaps further excavation to the east would shed more light on possible cultural differentiation.

The midden itself is comprised mainly of light to dark gray and brown, consolidated dune sand scattered through with varying quantities of shell and bone refuse. A simple presence

and absence tabulation of food remains is given in Table 2. The ground in the top few inches tends to be dry and very compact, but below this hard, exposed surface layer, the soil becomes soft and moist (Fig. 4, btm.).

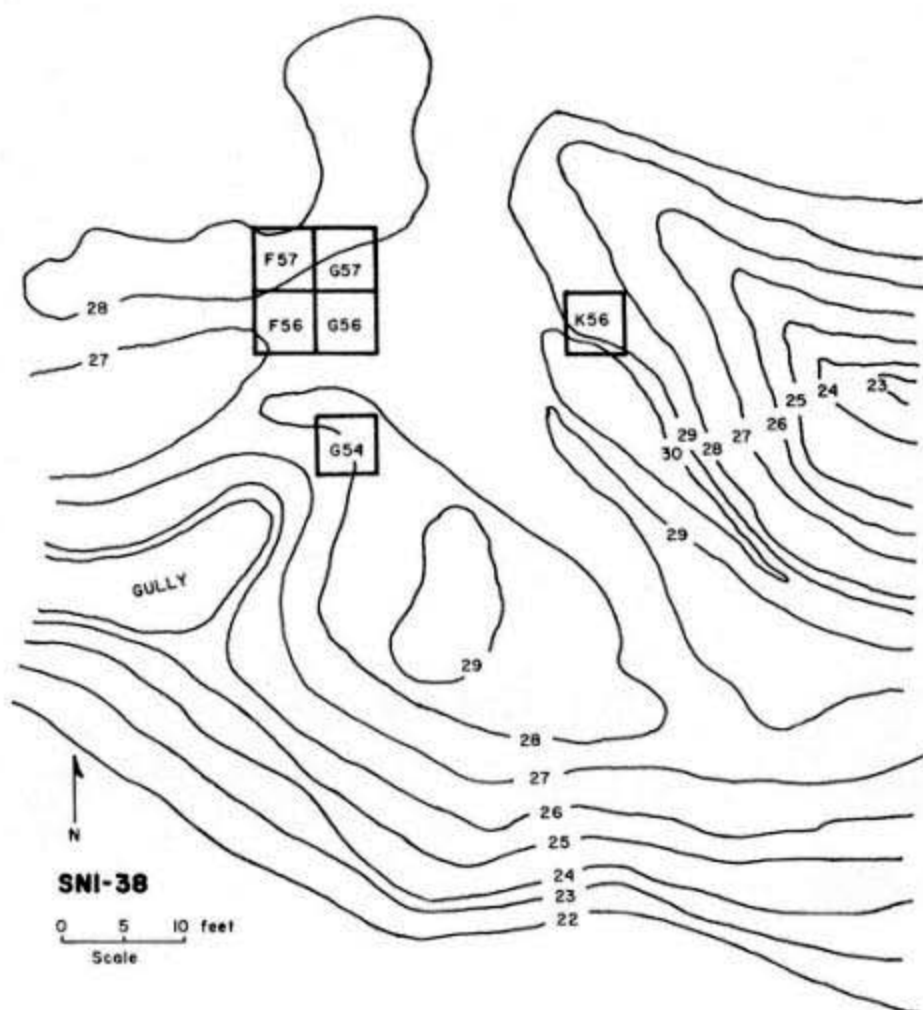


FIG. 3—CONTOUR MAP OF SOUTHERN QUARTER OF SITE SNI-38

FEATURES. A ten-foot square, comprising four adjacent five-foot squares, was measured out encompassing the area around the hole made by the two Navy men. Only a few small bones and fragments of woven sea-grass remained to be exposed in place so that no exact information regarding burial position or associations could be determined. It appeared to Starbuck from the limited concentration of bones that the body was in a flexed position and that the head portion would have been northeasterly. After careful excavation below where the bones had been, at a depth of about 15 inches beneath the surface, a layer of charcoal, as much as a half-inch thick in some places,

was encountered. The charcoal lined the bottom of an oval basin depression at least 10 inches deep and extending an estimated maximum of 4 feet east and west and 3½ feet north and south. The ground directly beneath the charcoal was reddish-orange in color and slightly more compact, probably caused by the burning. Some charred shell and animal bone were noted, but they could represent only subsurface refuse that had been incidentally burned when the fire was set. Scattered within the pit were fragments of woven sea-grass and some small concentrations of unwoven sea-grass. A few small, fragmented human bones were also mixed in. The sea-grass materials were not scorched, and only a few human finger bones show any evidence of having had contact with fire. At least 2 inches of midden lay between the human long bones and the charcoal concentration. Though the precise relationships of the burial to the charcoal-lined pit are not known, it is presumed that the two were associated and a form of pre-interment grave-pit burning is represented here. It was hoped that some charred perishables or other items might be found among the charcoal, but only a burned, small, elongate abalone shell pendant turned up. It disintegrated shortly after exposure.

The association of burned areas with burials on San Nicolas was also recorded by Alliot (1916) on the Southwest Museum's first expedition to the island in 1914 under the direction of William Herman Golisch who was collecting geological and conchological specimens. Alliot found some flexed burials with head slightly turned to the east, and evidence of four fires which had been kindled at each of the cardinal points. To the south, associated with the individual burials, were a broken bowl and pestle, and to the north, shell and ornaments.

Another feature uncovered at SNI-38 was a concentration of tarred pebbles at the 15 inch level in pit F57, about a foot away from the edge of the depression already described and to the north of it. Over 130 pebbles were found scattered over an area measuring 33 inches north and south and 25 inches plus (due to the fact that they continued into the west side wall) east and west. Bits of charcoal were noted thinly scattered among them. Though the pebbles were in the vicinity of the human bones and charcoal layer, it is not certain if the two features were associated. A second grouping of tarred pebbles, 19 in number, was recovered in the central portion of square G56 at a depth of 26 inches. Forty additional examples were found scattered at all levels in all squares.

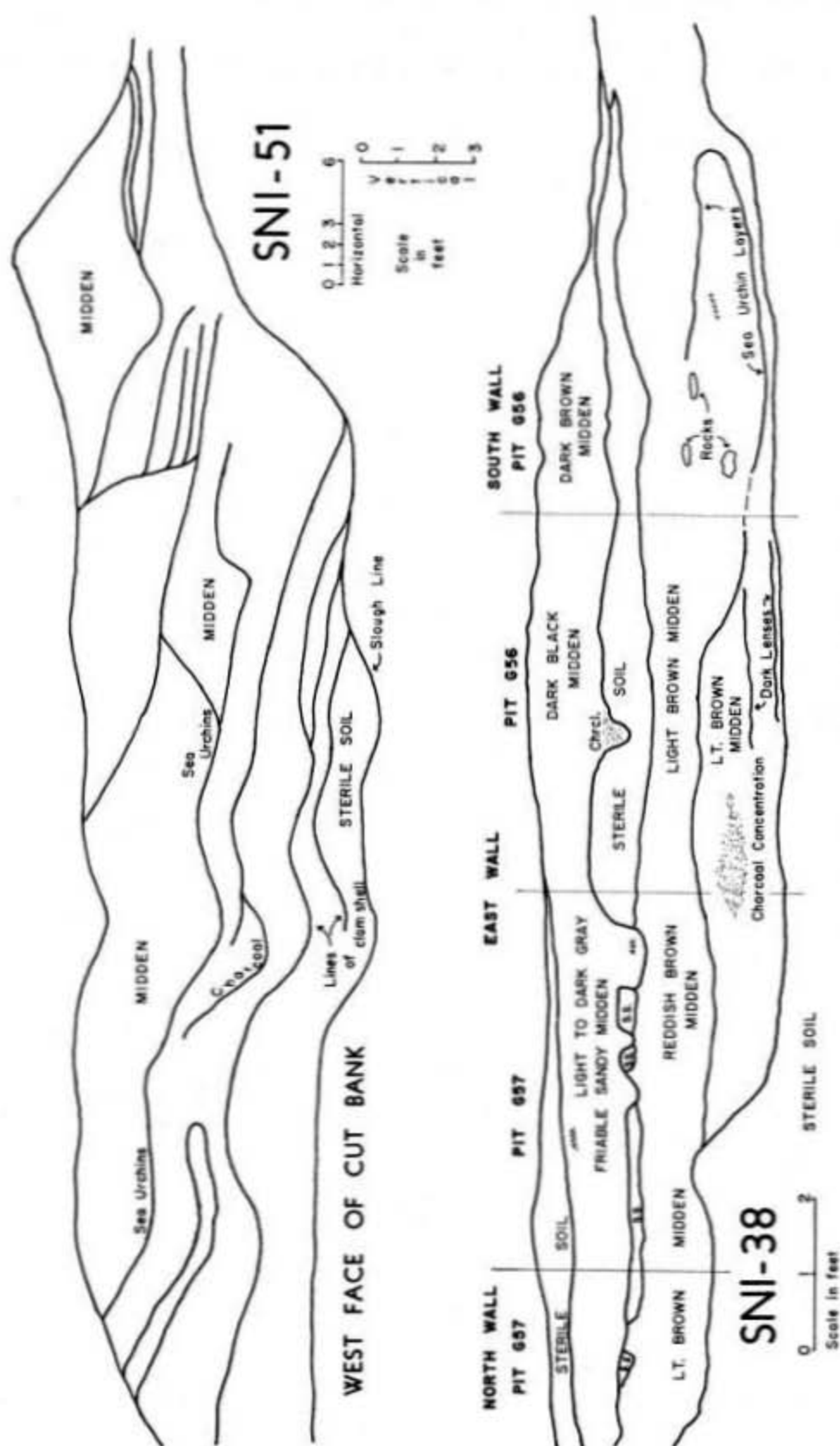


FIG. 4—SOIL PROFILES AT SITES SNI-51 AND SNI-38

BASKETRY. The waterproofing of basketry is the inferred use of the smooth, asphalt-coated stones noted above. Possibly the clusters of these rocks represent caches, ready for use, and perhaps stored in some container long since decayed away, rather than occurring simply as cast-offs after they had served their purpose. Basketry impressions, however, were noted only on one small piece of tar, measuring 29 by 25 by 6 mm., in the 12 to 18 inch level in square F57; details of weave could not be determined. Also in the same level and square were found two irregular blobs of asphaltum, one measuring 50 by 50 by 25 mm. and the other 43 by 33 by 26 mm.

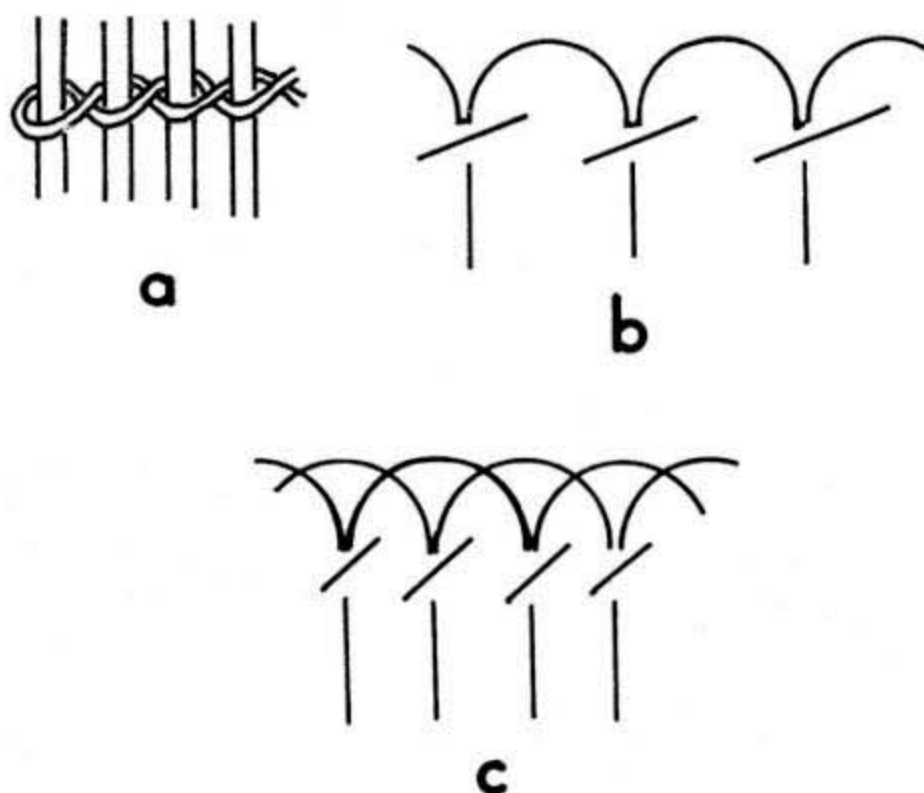


FIG. 5—DETAIL OF TECHNIQUES OF TWINING AND SELVAGES

WOVEN SEA-GRASS. More clearly defined evidence of weaving skills is afforded by the examples of woven sea-grass found scattered through the deposit. Over two dozen pieces, averaging around 75 mm. in maximum dimension, came from the initial digging in the vicinity of the human bones, but probably only two or three different fabrics are represented. Subsequent careful excavation through the site revealed about 15 fragments, slightly more than half of which were too fragile and small to be saved, but were of sufficient size to indicate the weave which was recorded on the level bag.

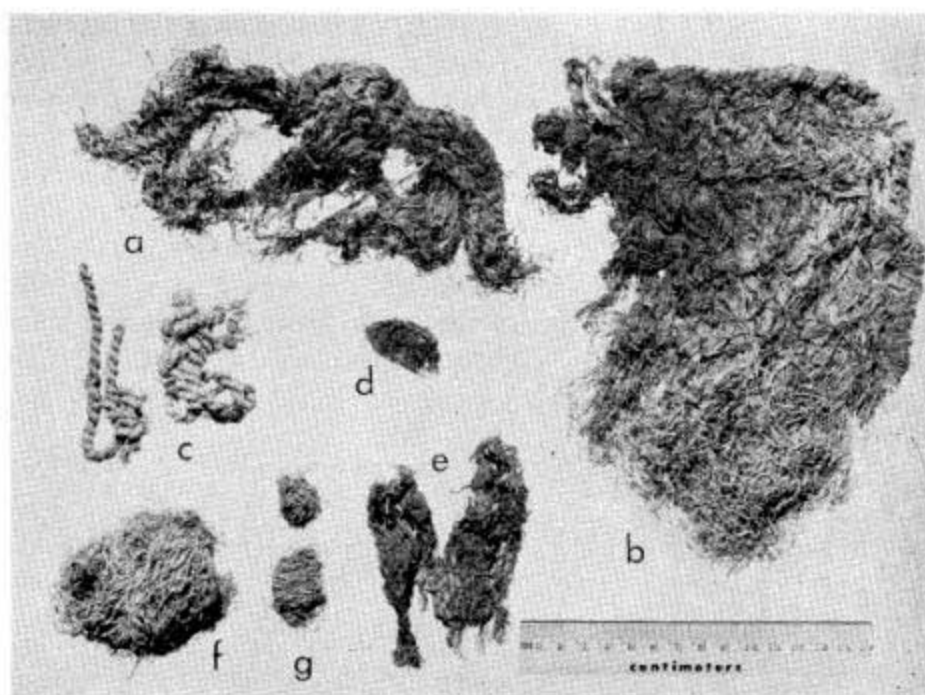


FIG. 6—EXAMPLES OF WOVEN SEA-GRASS, CORDAGE AND "PADS"

All examples have plain, 2-element S-twining (Fig. 5a), and were found in each 6 inch level of the midden to a depth of 42 inches. The warps and wefts are essentially small bundles of untwisted sea-grass (*Phyllospadix*). Occasionally within the mass of warp fibers, a piece of twisted cordage (Z-strand, 2 S-yarns) is found. All fabrics are warp face with weft intervals ranging from 13 to 36 mm. apart. Warps number 6 to 9 per 50 mm.

In the first 6 inches, a small fragment of "paired loop" top selvage (Fig. 5b), 35 mm. across, was found in square F56. The first weft row fills the bights and is made by braided, 3-element S-twining.

Edge selvage is represented by two types: 1) A single cord is simply doubled and then twisted about the end warp to form and begin the regular twining of the weft (Fig. 5a); 2) Four-element braiding is used to form the end warp and involves the wefts leaving and/or becoming incorporated into it. The latter example cannot be traced adequately from the fragmented specimens at hand, but is of a type more clearly seen in one or two examples in the collection of the Antelope Valley Indian Museum.

CORDAGE. About 20 examples of twisted cordage made from sea-grass (*Phyllospadix*) were recovered from all levels (Fig. 6c). Structurally, most are S-strand, 2 Z-yarns (see

Dixon, 1957 for explanation of terminology). The Z-strand, 2 S-yarn examples are usually found in the body of the fabrics as mentioned above. One Z-rope, 2 S-strands, 2 Z-yarns was found in the 30-36 inch level; it is 6 mm. thick and has 4 twists per 25 mm. Thicknesses of the strands in the total collection range from 1.5 to 9 mm. with 11 and 4 twists respectively per 25 mm. From the sample at hand, no clear cut stratigraphic significance can be derived regarding the two types of strands. Two or three pieces of 4-element braiding came from the surface, but these may be remnants of edge selvage warps rather than individual pieces of cordage.

STONE ARTIFACTS. Artifacts of stone from SNI-38 number 28 and include both ground and flaked examples. There was little in the way of refuse stone in the midden and the few pieces that did turn up were broken cobbles and flakes of granite, porphyry, quartzite, and sandstone. Two small, flat, unworked pieces of reddish decomposed shale, the largest measuring 49 mm. in maximum dimension, and one piece of hematite were also found, and possibly were used as a source of paint. Flaked stone artifacts were the more numerous and are comprised mainly of core and flake scrapers and hammerstones.

Core scrapers (Fig. 7l, m) are formed by percussion flaking along one side or end of rounded, water-worn cobbles, resulting in a cutting edge with a high angle. The rest of the rock is left unmodified. Of the 7, 3 are made of quartzite and 4 of porphyry. Dimensions range from 73 mm. long, 60 mm. wide, 46 mm. high to 54 mm. long, 42 mm. wide, 21 mm. high.

Flake scrapers (Fig. 7h, i) are represented by 4 examples, 2 made from quartzite and 2 from porphyry. They are irregular flakes struck from rounded cobbles and have been modified by the removal of a few rough flakes along a part of one edge. Dimensions range from 94 mm. long, 54 mm. wide, 14 mm. thick to 53 mm. long, 48 mm. wide, 16 mm. thick.

One flake of banded black and white (Franciscan?) chert shows use along one edge (Fig. 7j). It measures 46 mm. long, 21 mm. wide, and 9 mm. thick.

The only example of a core is a small piece of whitish quartzite with narrow flake scars down its length (Fig. 7k). The dimensions are 35 mm. long and 27 mm. in maximum thickness.

There are 10 cobbles or portions of cobbles which have had large flakes removed over much of the surface to form sharp edges which were then dulled through use as hammerstones.

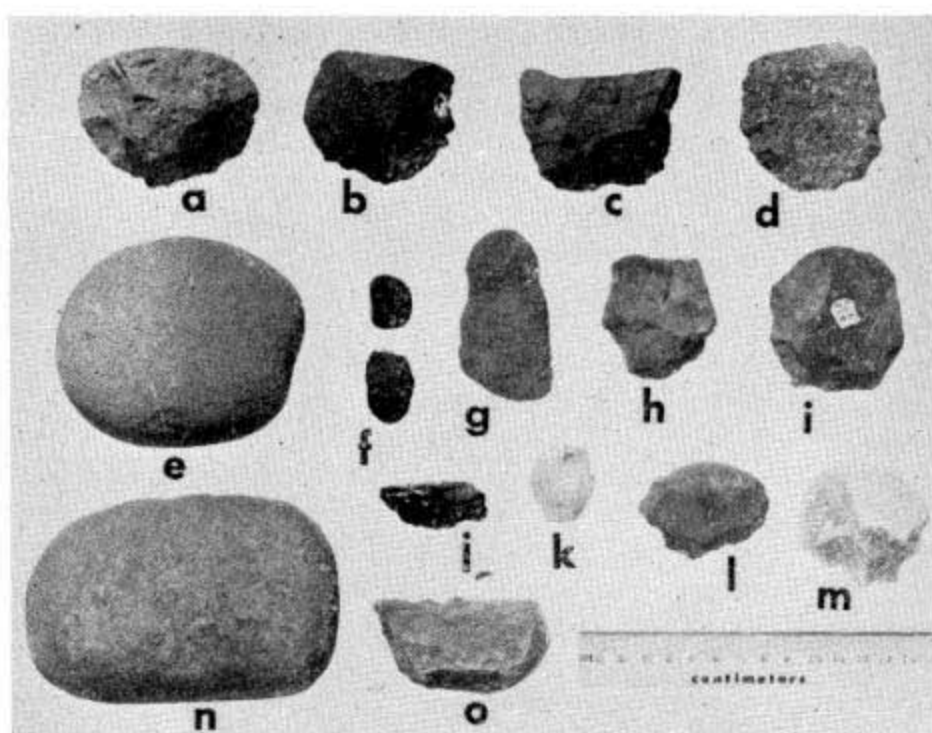


FIG. 7—FLAKED AND GROUND STONE ARTIFACTS

The edges of two are such that they may also have served as choppers (Fig. 7o). Four are made of granite, 4 of porphyry, and 2 of quartzite. The largest measures 89 by 76 by 60 mm. and the smallest is 75 by 37 by 35 mm.

Only 4 ground stone artifacts came from SNI-38 and they are made of sandstone. A small, thin piece of red sandstone, from the 18-24 inch level, shows evidence of wear on one side and possibly was used briefly for grinding paint. It measures 65 by 57 by 5 mm. A second, fragmented sandstone rock in the 36-42 inch level has some indication of grinding on its one convex surface, and may have been used as a rubbing tool. The third example is a uniface mano, broken in half and badly weathered. Found between 24 and 30 inches, it is of oval outline, thin in cross-section, with dimensions of 92 mm. wide, 26 mm. thick and 90 mm. long to the broken end. The last ground stone tool, from the surface, is the upper portion of a pestle, sheared in half (Fig. 7g). There is a groove at one end indicating it had a knobbed appearance.

BONE ARTIFACTS. Objects made from bone found at SNI-38 number 22 items. Of the 6 awls uncovered, 5 are made from bird bone. Three consist of the whole bone (an ulna, radius, fibula) with a cut point at one end and the head intact at the other (Fig. 8g, h, i). Two more are made from

split bone, one being sharpened at both ends (Fig. 8k), the second showing a single, broadly-pointed tip (Fig. 8l). Another piece of split bird bone may have been an awl; though the point is missing, there is some asphaltum at the other end which may be the remains of a handle (Fig. 8f). The sixth definite example of an awl is made from part of the scapula of a sea mammal (sea lion?) which has been worked to a point at one end (Fig. 8j).

Two possible punching tools are represented by a short, thick piece of bone rubbed to a blunt point (Fig. 8o) and another tapered piece of bone which is broken at both ends (Fig. 8n).

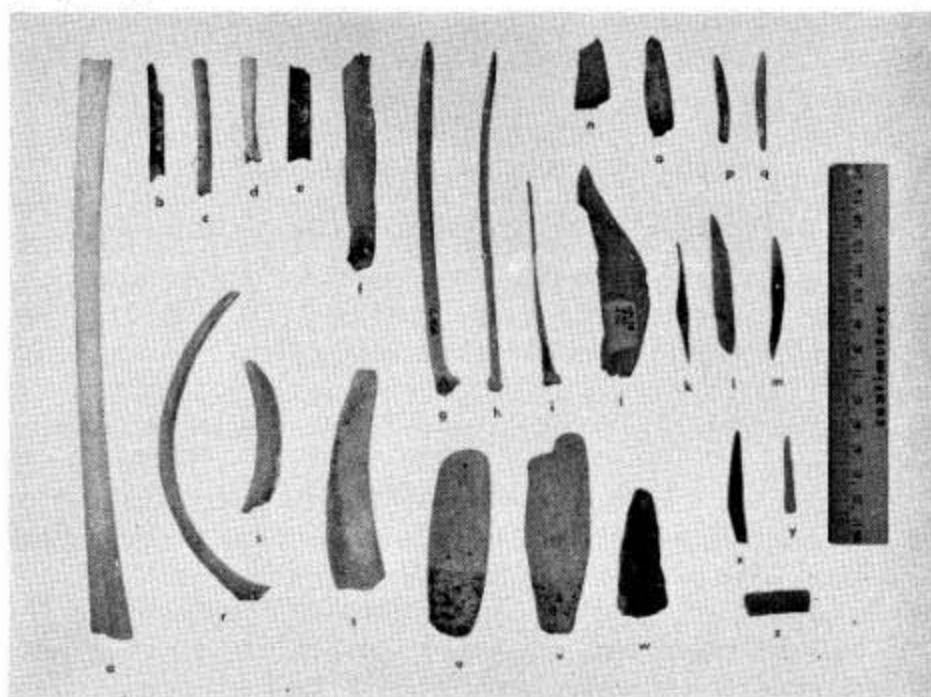


FIG. 8—BONE IMPLEMENTS

Of the 3 bone barbs from SNI-38, two are bi-pointed (Figs. 8q, m) and the third has one blunt end (Fig. 8p). One of the bi-pointed specimens has traces of asphaltum on one side and may have been used as a toggle fishhook (Fig. 8m).

There are two short pieces of whale bone which probably served as chisels or scrapers (Fig. 8u, v). Asphaltum still adheres to the blunt ends of both. A third fragment of similar bone smeared with tar on one surface may be the basal portion of a similar tool (Fig. 8w).

Three sea mammal rib bones (of sea lion?) show wear at one end and may have been used as smoothers or flakers (Figs. 8r, s, t).

Five bird bones show evidence of having been cut at the ends (Figs. 8a, b, c, d, e).

SHELL ARTIFACTS. Artifacts made from shell were the most numerous items recovered from SNI-38. Finished curved fishhooks outnumber all the rest with a total of 61 (Fig. 9, top row, 3 right of center in 2nd row). All fishhooks retaining their shanks (32) show evidence of a bulbous protuberance for holding the cordage line, rather than an elongate groove or a pointed, plain form with asphaltum. One (Fig. 9, 1st row, second from left) has a slight notch cut in the outer edge, but probably represents an incomplete example. Sizes range from 45 mm. long, 33 mm. wide, 3 mm. thick to 17 mm. (estimate) long, 13 mm. wide, 2 mm. thick. Abalone (*Haliotis* sp.) and Norris' Top Shell (*Norrisia norrissi*) were about equally preferred.

In addition to the completed pieces, there are 19 fishhook blanks. Six are roughly cut-out ovals (Fig. 9, 3rd row, 1st three) made from abalone shell (*H. rufescens*, 5; *H. fulgens*, 1) and 13, made from *Norrisia norrissi* (9) and *Haliotis rufescens* (4), have the outer edges smoothed and worked into the form of a tear drop or pointed oval (Fig. 9, 3rd row, right end). Only one of the latter is complete, however, with an off-center hole (Fig. 9, 3rd row center); the rest are fragments caused by breakage probably when they were being worked on.

There are 2 broken specimens (Fig. 9, 2nd row, 1st 2 at left) which are similar to the fishhooks, but are forked at one end producing what might be called an inner barb. One is made of abalone and the other of Norris' Top Shell.

There are 3 shell oval rings with central holes and the outer rims ground to form thin walls (Fig. 9, 2nd row, end). Two are made from the Rough Keyhole Limpet (*Diadora aspera*). The smallest of the three is made from the Volcano Shell (*Fissurella volcano*) (Fig. 9, 2nd row, right end).

Beads are represented by a small disc cut from the body whorl of the Purple Olive shell (*Olivella biplicata*) and by the whole shells (2 examples) of the same species and 2 whole shells of the California Cone (*Conus californicus*). The latter have their tips missing (possibly beach worn) and one has in addition a hole punched in the lower portion of the body whorl (Fig. 9, 4th row, 5th from the left). Of the whole Purple Olive shells, one has no tip and the other has a hole punched in the upper part of the body whorl. About 40 Purple Olive shells, irregularly broken lengthwise but retaining the aperture portion intact, were picked up from the surface in a

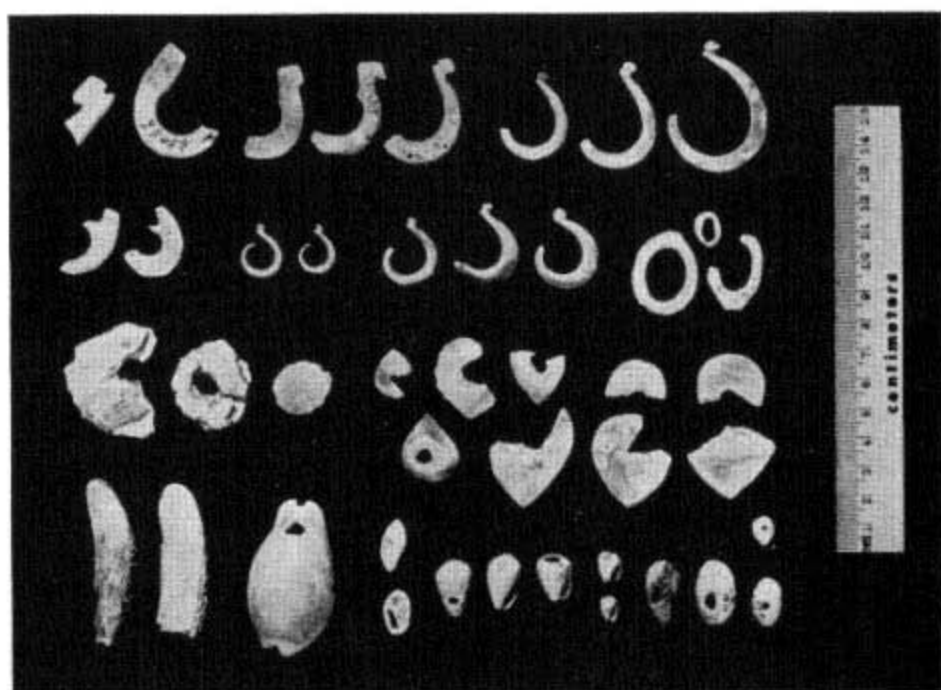


FIG. 9—SHELL ARTIFACTS

cluster (Fig. 9, 4th row, 4th from left). It is not certain whether they could represent a crudely-made necklace or the discard after having extracted the animal for food.

A Chestnut Cowry shell (*Cypraea* (*Zonaria*) *spadicea*) perforated at the narrow end (Fig. 9, 4th row, 3rd from left) and the half lip of another were recovered. A scallop (*Plagioctenium circularis aequisulacatus*) with a 7 mm. diameter center hole and two fragments of the curved rim of abalone (*Haliotis* sp.) worked to a blunt point (Fig. 9, 4th row, first 2) round out the inventory of shell artifacts from SNI-38.

SITE SNI-51

Site SNI-51 is at the eastern edge of Dutch Harbor in the south central portion of the island. Midden debris is scattered over an area some 380 feet long and 180 feet wide. The length of the site extends up a gradual slope inland and drops off sharply at the sides due to the cutting of small arroyos. SNI-51 is heavily eroded and the southern quarter, though cut by a wide bulldozer gash, seems to hold the most promise for investigation. This lower section of the site is about 45 feet above sea level. The sides of the gouged-out trench show evidence of midden to occur as deep as 9 feet (Fig. 6 top) within consolidated dune sand which is easily dug. Scattered in layers, and at times heavily concentrated in thick

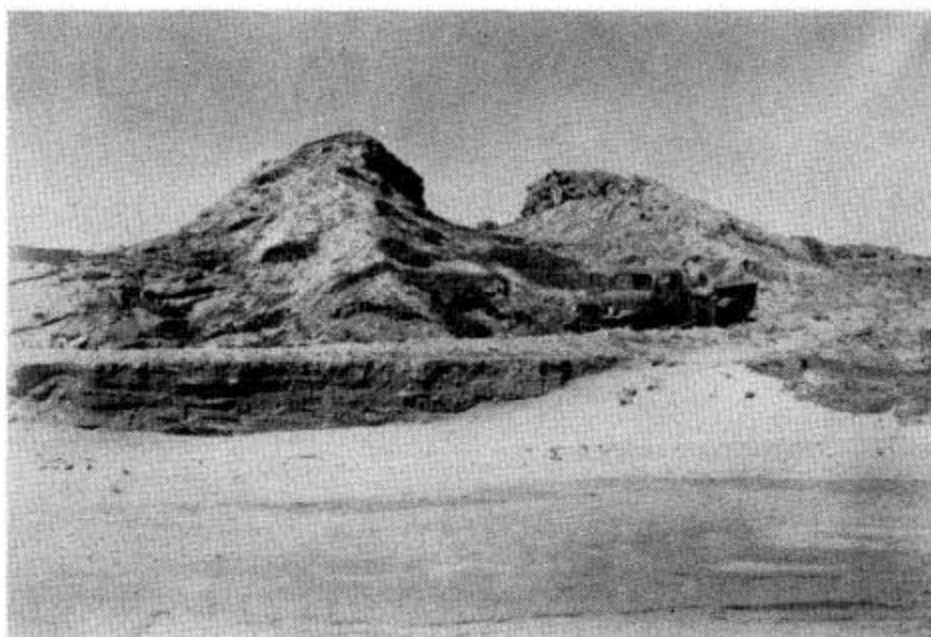


FIG. 10—SITE SNI-51, LOOKING NORTH

lenses, are the remains of shellfish, sea urchins, fish and sea mammals. The west side of the site was worked by putting down two five-foot squares along the edge of the cut. Due to lack of time, the pits were excavated to a depth of only 24 and 36 inches.

WOVEN SEA-GRASS. Fourteen pieces of woven sea-grass were found and all but two have some remains of selvage. The basic weave is plain, 2-element S-twinning, with braided, 3- and 4-element S-twinning found in the top selvage of four specimens. Sizes of the fragments range from a loose scrap only 15 mm. across to a piece 170 mm. wide and 230 mm. long. Textures vary from 4 to 12 warps per 50 mm. and 2 (Fig. 6b) to 5 (Fig. 6e) wefts per 50 mm.. All fabrics are warp face, as can be seen in the weft count.

The top selvages of all except two with "one-paired over-loops" (Figs. 5c, 6b) are of the "paired loop" type. The first wefts below the bights are variable in weave and number. With four exceptions which have only a single weft row (Fig. 6b), the warps are held at the top by two adjacent weft rows usually filling the bights. Four have double weft rows of plain, 2-element S-twinning; one has braided, 3-element S-twinning as the first weft row and plain, 2-element S-twinning, for the second; and another (Fig. 6a) has plain, 2-element S-twinning for the first weft row and braided, 4-element S-twinning immediately following. The others, with single weft rows

at the top, include two with plain, 2-element S-twining, one (Fig. 6d) with braided, 3-element S-twining, and one with braided, 4-element S-twining.

Edge selvage includes the first kind described for SNI-38 where the single weft piece is simply twisted around the end warp to begin the twining process (Fig. 5a). Additional edge treatments of wefts at SNI-51 are simply to wrap them several times around the end warp or the two weft elements are continued back across the fabric after being looped around the last warp (Fig. 6b).

UNWOVEN SEA-GRASS. Three wads of unwoven sea-grass were found at SNI-51. They are simply bunches of sea-grass which have been wound around or folded to form a small pad, possibly used by women at time of menstruation (Fig. 6f). The sizes are 135 by 70 by 25 mm., 95 by 57 by 18 mm., and 70 by 57 by 50 mm. Two smaller pieces were also found (Fig. 6g).

CORDAGE. Over 20 pieces of twisted sea-grass (*Phyllospadix*) cordage were uncovered at SNI-51. All were found to be S-strand, 2 Z-yarns, except one short scrap of Z-strand, 2 S-yarns. The range of diameters and number of twists vary from 2 mm. thick and 25 twists per 50 mm. to 8 mm. thick and 10 twists per 50 mm. There are two examples of braided cordage, the single elements of which are untwisted. One, from a depth of 12 inches, is composed of 3 elements, varying in thickness from 3 to 6 mm., and together they form a cord 6 to 10 mm. wide. The second, recovered from the 12-18 inch level, is made up of 4 elements, each 4 mm. thick, and they combine to make a cord 9 mm. in diameter.

STONE ARTIFACTS. Rocks were rare in the midden and included broken cobbles, pebbles and flakes of granite, porphyry, quartzite, and sandstone. Two biface manos of sandstone from the 18-24 inch level were the only ground stone tools found at SNI-51. One is slightly oval in outline and shows more use on one side (Fig. 7c); it is 40 mm. thick. The other mano (Fig. 9n) has a badly weathered second surface, but shows remnants of grinding there. It is well shaped into a rough rectangle; it is 43 mm. thick.

The few flaked tools that came from the site were made by percussion methods to produce rough flakes and core scraping implements. The granite and quartzite material from which they were made is not conducive to much fine retouching. Eight worked pieces are categorized as core tools (Figs. 7a, b, c), with a high back and steep angle cutting edge being main

TABLE 1

DEPTH DISTRIBUTION OF ARTIFACTS														
	SNI-38								SNI-51					
	S	0" 6"	6" 12"	12" 18"	18" 24"	24" 30"	30" 36"	36" 42"	0" 12"	12" 18"	18" 24"	24" 30"	30" 36"	
STONE														
Scrapers (core)		1	1	3		2			2	2		4		
Scrapers (flake)	1		1	1	1					1		1		
Used flake	1													
Core						1								
Hammerstones			1	4	3	2				1				
Mano						1		1			2			
Pestle									1					
Shows grinding					1									
Red paint					2	1								
Tarred pebbles			3	9	16	19	4	8	3	3				
BONE														
Awls		1	1	1	2	1	1		1					
Barbs					1	1			1					
Toggle fishhook						1								
Chisel blades	1		1	1		1								
Smoothers, flakers				1	1	1								
Cut bone				3				2			1 (bead)			
"Punching tools"					1		1							
SHELL														
Fishhooks	11		5	5	11	9	16	4	1	2	2	5		
Beads														
Conus calif. (side hole)				1										
Conus calif. (top off)				1										
O. biplicata (side hole)					1									
O. biplicata (top off)				1										
Pusula californiana	1													
Zonaria spadicea (perf.)			1											
"Rings"	1			1			1							
"Barbed" fishhook (?)	1					1								
Shaped fishhook blanks			1	2	3	1	1	4						
Unshaped fishhook blanks			1	2	2									
WOVEN SEA GRASS														
Plain, 2-element S-twined			†	†		†		†		†	†	†		
Braided, 3-element S-twined									†	†		†		
Braided, 4-element S-twined											†			†
Top Selvage														
Paired Loop									†	†	†	†	†	†
One-paired Overloop											†	†	†	†
CORDAGE														
S-strand, 2 Z-yarn			†	†	†		†	†						
Z-strand, 2 S-yarn				†										
Z-rope, 2 S-strand, 2 Z-yarn								†						

characteristics. The unifacially-flaked edge tends to be semi-lunar in outline. In four examples the sharp edge is intersected by the natural smooth surface of the rock. Dimensions range from 102 mm. long, 58 mm. wide, 70 mm. high to 59 mm. long, 43 mm. wide, 30 mm. high.

Three smaller scraping tools were also found. The largest is a unifacially flaked scraper made from the outer portion of a smooth-surfaced granitic rock (Fig. 7d). The second scraping tool is a small "thumbnail" scraper, square in shape (20 by 20 by 9 mm.) and made of black chert. The last example is a piece of milky quartz, 37 by 26 by 10 mm., which shows use along one edge.

There is one fragment of a hammerstone, 62 mm. in maximum dimension, made from granite. The ridge along the outer edge shows it to have been well battered.

Six tarred pebbles were found, scattered from the 6 to 18 inch levels (Fig. 7f). Maximum dimensions range from 19 mm. to 46 mm.

BONE ARTIFACTS. Only three bone artifacts were found at SNI-51. A piece of bird bone, 9 mm. in diameter, has evidence of having been cut at both ends and may have been used as a bead (Fig. 8z). It was found eroding out of the cut bank at a depth of two feet.

Sea-mammal bone was probably used to make the other two implements, which were both found in the first foot of excavation. One is a barb (Fig. 8x), broken at the base; the lower portion is ground very flat on one surface and is slightly so on the other. It is 6.5 by 5 mm. through the center. Though the tip and base are missing, the third tool (Fig. 8y) was probably used as an awl; it measures 4.5 by 3.5 mm. at the base.

SHELL ARTIFACTS. Shell artifacts from SNI-51 include only curved fishhooks and beads. Of the 12 fishhooks (Fig. 9, 2nd row, 3rd & 4th from left), 4 are made of abalone (*Haliotis* sp.) and 8 of Norris' Top Shell (*Norrisia norrissi*). In those cases where the shanks have been preserved, the end has a small knob which held the fishline. Dimensions extend from a maximum of 32 (estimate) by 25 by 4 mm. to a minimum of 17.5 by 12.5 by 2 mm.

Beads (Fig. 9, 4th row, & right end) are made from the whole shell of the Purple Olive (*Olivella biplicata*), California Cone (*Conus californicus*), and the Coffee-bean Shell (*Pusula californiana*). The single example of the latter has a small hole in the upper portion of the back of the shell; the shell's length is 9 mm. The 3 California Cone shells measure 8.5 mm.,

16 mm., and 19.5 mm. and all have their tips missing; the whole spire of the smallest is ground off, while the other two have one or two of the whorls still remaining. Of the 4 Purple Olive beads, 2 have no tops and the other 2 are complete at the top but have a hole in the body whorl. Their lengths range from 10 to 22 mm.

CONCLUSIONS

The limited work done at the two sites reported on here affords some definite stratigraphic information on San Nicolas Island which heretofore has not been published in detail. Heavy erosion had made it an easy matter for earlier investigators to gather an abundance of materials simply by collecting from the surface or by digging into exposed burial grounds with only limited possibilities regarding information on location and/or association. The restricted geographical area, the seemingly continuous indications of Indian occupation, the apparently relatively shallow deposits, and the quantities of similar artifacts have all given the impression to some that San Nicolas is itself just one big site representing a single culture or a static cultural tradition through time. The extent to which these conditions reflect the true situation, however, has yet to be accurately demonstrated and to accomplish this end, individual site reports will be vital. Though greatly eroded, sites appearing to be largely destroyed or to have only about a foot of deposit may in reality have significant amounts of midden remaining and be several feet in depth as SNI-38 showed. Weather and man have taken and are taking their toll of the island's archeology, but the author observed that there still remain sites of enough extent and depth to give a good record of the island's history and culture.

The materials recovered from the two sites fit easily into the general coastal cultural complex of southern California and generally are representative of the late horizon to which the name Canaliño is most frequently applied (Rogers, 1929; Orr, 1952; Wallace, 1955). Shell fishhooks, fishhook blanks, bone awls, bone barbs and gorge fishhooks, cut bone, shell beads, tarred pebbles, manos and pestles are the typical classes of artifacts to be found in many littoral middens (e.g., Walker, 1951, Wissler, 1958). Grinding implements and core tools characterize the mainland's earlier periods (Peck, 1955; Treganza and Bierman, 1958; Wallace, 1954; Wallace et al, 1956), but they also lasted into later times (Winterbourne, 1938, 1940; Curtis, 1959). The ground stone artifacts are usually thought to have been used in the preparation of plant

foods, but there is always the possibility they could have been used to pulverize certain sea foods. For the island as a whole, stone mortars and pestles have been found more frequently than the flat grinding tools. No milling stones were noted by Meighan and Eberhart (1953, p. 113) and only one thick metate with a flat grinding surface was seen on the author's survey. Several small, flat rocks were observed that could have served as hand stones, but they were too weathered for one to be sure that they had been used. The manos and core scrapers excavated at the two sites might be an indication of some early manifestation since they occur below 18 inches though the latter are also found above. Perhaps investigation of the lower levels of SNI-51 will give a clearer idea of this situation.

Throughout the sites the preponderance of shell fishhooks over all other artifacts provides strong evidence of late occupation. Over a long period a gradual shift in emphasis from land to sea resources is seen on the coast and it would seem that by the time San Nicolas was first occupied, the adjustment to the ocean would have been fairly complete. Whereas on the mainland important supplements of land mammals and plants were more readily available, plentiful and utilized, San Nicolas' limited resources and isolated location no doubt forced the islanders to be dependent on the sea even more. What land provisions were available were possibly soon greatly diminished, if not exhausted. This intensified orientation of the economy to the water is reflected strongly by the midden refuse and the fishing implements found in the sites. The Canaliño period has been divided into Early, Middle, and Late (Orr, 1943) and the sites discussed here fit more easily into the Late end of the sequence. The extensive use of woven sea-grass and the numerous shell fishhooks compare well with the Late Canaliño on Santa Rosa Island, whereas these items are missing in the Early phase (Orr, 1956, p. 5).

The artifacts excavated from the two San Nicolas sites include types that have widespread distribution in coastal mainland and island southern California. Regional cultural variations have been worked out ethnographically (Kroeber, 1925) and undoubtedly equally important differences existed in the past. However, much of the material culture tends to be characterized by similar broad categories with minor variations which blend or have a wide style range. In this, significant details, either quantitative or qualitative, indicative of differentiation must yet be worked out more fully.

Nevertheless, woven materials show great promise in providing detailed information on areal distinctions and the woven sea-grass fabrics from San Nicolas are no exception (Rozaire, Ms.). S-twining is characteristic of San Nicolas Island as well as Santa Catalina (Los Angeles County Museum collections) and San Clemente (Rozaire, 1959) islands to the south. The northern islands have woven sea-grass which is predominantly Z-twined (Jones, 1956, Pl. 120b; Rogers, 1929, Pl. 52 btm., Orr, 1956, Fig. 2, Santa Barbara Museum of Natural History collections).

These distinctions of weave (from basketry) seem to continue directly across the island groups to the adjacent mainland counties of Los Angeles-Orange and Santa Barbara, whose boundaries also roughly approximate the historic linguistic and cultural differences noted by Kroeber (1925). If the culture history of the coast as postulated from linguistic evidence holds, wherein the entire coastline at one time was populated by Hokan-speaking people and then subsequently separated by a wedge of Shoshonean-speaking people (Kroeber, 1925, p. 578), it would make an interesting check to see if Z-twined materials underlay S-twined. The excavations reported on here did not give any indications of this situation, but the lower levels of SNI-51 have yet to be worked to verify this point.

Definite dates for the two sites in terms of absolute time will have to await the testing of midden materials by one of the specialized dating procedures which have been developed. For the present, time considerations will have to be based on comparisons with other work for which more precise dates have been acquired. Radiocarbon tests on materials from a well-defined midden on Santa Rosa Island indicate an occupation of the Channel Islands as far back as 5120 B.C. \pm 250 (Orr, 1956, p. 6), a time preceding Canaliño by several thousand years. The pre-Canaliño site of Little Harbor on Catalina Island has a date of 1924 B.C. \pm 250 and on the basis of comparative data, Meighan (1959, pp. 384-6) estimates a beginning for Canaliño at about 1000 B.C. Orr (1956, p. 5) gives what he considers to be a conservative "guess age" for its start at around 1500 B.C. From Santa Rosa Island, Orr (1956, pp. 4-5) received a date of 96 A.D. \pm 350 on woven sea-grass from a Late Canaliño site and 634 B.C. \pm 350 in what appeared to be an Early Canaliño deposit. In addition, shell fishhooks have been dated at about 150 A.D. in Monterey County, almost at the northernmost extent of their distribution (Meighan, 1959, p. 399).

On the basis of this information it would appear that the middens excavated on San Nicolas were probably occupied at least from early A.D. times and could have been inhabited back into some B.C. period, especially SNI-51 site with its great depth. Further excavation will be required to see if a pre-Canaliño complex is there, and dating tests will be needed to confirm the suggested time presented here.

NOTES ON ANIMAL REMAINS

Some of the mammals from San Nicolas Island and the most easily identifiable categories in which they fall include *Urocyon littoralis dickeyi* (Island Fox); *Canis familiaris* (Domestic Dog); *Enhydra lutris* (Sea Otter); Family Otariidae with *Zalophus* and *Eumetopais* (Sea Lions) and *Callorhinus* and *Arctocephalus* (Fur Seals); Family Phocidae with *Phoca* and *Mirounga* (Earless Seals); Family Delphinidae with Porpoises, Dolphins; and Whales.

As for the two sites excavated, the Family Otariidae is represented almost exclusively by the bones of *Zalophus californicus* (California Sea Lion). There is a possibility that *Eumetopais jubata* (Stellar Sea Lion) may also be present, as the two Sea Lions are similar. In site SNI-38, *Arctocephalus townsendi* is probably present in the 12-18 and 36-42 inch levels. Evidence of *Callorhinus* was not found. The Family Phocidae is represented in all cases by *Mirounga angustirostris* (Elephant Seal). *Phoca* (Harbor Seal) remains were not evident. *Urocyon littoralis* (Island Fox) was not present in any of the levels.

ACKNOWLEDGEMENTS

The work reported on in this article was carried on through the cooperation of the U. S. Navy personnel connected with the Pacific Missile Range installation at Point Mugu, California, which has jurisdiction over San Nicolas Island. The author is indebted to Rear Admiral J. P. Monroe, Commander of the Pacific Missile Range at Point Mugu, for making the expedition possible, and to Lt. Comdr. E. P. Carlson and Lt. Comdr. L. V. Schoenfeld, Officers-in-Charge of San Nicolas Island, for their help in facilitating the work. Appreciation is also expressed to Lt. Jg. J. F. Lynch, Lt. R. E. Jaycox and Mr. R. W. Sexty, Public Affairs Officers, for handling the arrangements, and to Seamen W. Richard Cook and David Creighton for their assistance.

TABLE 2

Invertebrates		0" 6"	6" 12"	12" 18"	18" 24"	24" 30"	30" 36"	36" 42"	42" 48"
PELICIPODA									
<i>Hinnites multirugosus</i>	Gale		*		*				*
<i>Mytilus californianus</i>	Conrad		†	†		§			
<i>Mytilus edulis</i>	Linnaeus		*	*	†	*	*	*	*
<i>Plagioctenium circularis aequisculatus</i>	Carpenter		*						
<i>Septifer bifurcatus</i>	Conrad		*	*	*	*		*	
GASTROPODA									
<i>Acmaea mitra</i>	Eschscholtz		§	§	*				
<i>Acmaea scabra</i>	Gould		§						
<i>Astraea undosa</i>	Wood	*	*	*	*	*	†	*	
<i>Conus californicus</i>	Hinds			§	§				*
<i>Crepidula adunca</i>	Sowerby		*		*		*	*	
<i>Crepidula onyx</i>	"		*						
<i>Fissurella volcano</i>	Reeve	*	†	*		§		*	
<i>Haliotis cracherodi</i>	Leach	*	†	†	†	†	†	*	*
<i>Haliotis fulgens</i>	Philippii	*	*	*	*	*	*	*	
<i>Haliotis rufescens</i>	Swainson	*	†	†	†	†	†	*	
<i>Lottia gigantea</i>	Gray	*	†	†	†	*	†	*	
<i>Megathura crenulata</i>	Sowerby			*	*		*	*	
<i>Olivella biplicata</i>	Sowerby	*	†	†	†	†	*	*	
<i>Polinices lewisi</i>	Gould	*	*	†	†	†	†	*	
<i>Polinices reclusianus</i>	Deshayes			*					
<i>Pusula californiana</i>	Gray				*				
<i>Tegula gallina</i>	Forbes	*	†	†	†	*	*	*	
<i>Trimusculus reticulatus</i>	Sowerby		†	*	*	*			
<i>Zonaria spadicea</i>	Swainson				*	*	§		
AMPHINEURA									
<i>Mopalia muscosa</i>	Gould			*				*	
ECHINOIDEA									
<i>Strongylocentrotus purpuratus</i>		*	†	†	†	†	*	*	*
CRUSTACEA									
Tribe Brachyura			*	*	*			*	
CERRIPEDIA									
<i>Balanus</i> sp.			*	*				*	
Vertebrates									
MAMMALS									
<i>Canis familiaris</i>					*	§			*
<i>Enhydra lutris</i>				*	*	*	*		
Otariidae		†	†	†	*	†		†	
Phocidae		§	§	†		§	§		
Delphinidae						§			
Whales									*
FISH (several species, only two identified)									
<i>Pimelometopon pulchrum</i> (Sheep-head)		†	†	†	†	†	†	*	
<i>Sebastes miniatus</i>									*
BIRDS (several species, not identified)									
		†	†	†	†	†	†	†	†

* Key: * is present in SNI-38; § is present in SNI-51; † is present in both sites.

Excavation work was carried on with the volunteer help of George Kritzman for the full two weeks, David Rice for one week, and Edward Mitchell, Jr. and Lynn Bailey for shorter periods, and to them grateful thanks are expressed. Additional gratitude is extended to George Kritzman for identifying the shell remains and helping in the preparation of the maps and profiles, and to Edward Mitchell, Jr. for identifying the faunal remains.

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